

INDIVIDUAL RECOGNITION AND SUPPRESSION OF AGGRESSION AGAINST FORMER MATES IN *GONODACTYLUS BREDINI* (CRUSTACEA: STOMATOPODA)

In laboratory tests, gonodactylid stomatopods use individual recognition to mediate intra- and interspecific aggression (Caldwell, 1985). Intruders identify the odour of previous opponents and decide whether to fight based on experience with them. However little is known of stomatopod use of recognition systems in the field.

Gonodactylus bredini is a common stomatopod on the Atlantic coast of Panama where this study was conducted. Reproduction is synchronised. Breeding pairs form a few days prior to the full moon, sharing a crevice for several days. Within hours of the female spawning, the male leaves. She remains in the crevice, brooding the eggs and larvae for four weeks until they enter the plankton. Empty cavities are rare and males, after leaving their mates, may have to evict a crevice resident to secure a home (Caldwell, 1986). While searching for a crevice, a male might encounter his former mate and attempt to usurp the breeding crevice. This would jeopardise her offspring, which, in all probability, are also his. Here, I report that formerly mated *G. bredini* recognise one another and avoid fighting for several days after males leave the breeding crevice and while females are still brooding.

Procedures

Fifteen *G. bredini* male-female pairs were collected in the field, placed in artificial cavities of appropriate volume, and housed in individual aquaria. They were checked daily to determine when the female spawned and the male left the crevice, after which time he was placed in a separate container. Thirteen days later, the female, with her eggs, was placed in a similar crevice in another aquarium. At the same time, a second brooding female, matched for size and egg development, was established in a separate tank in an identical crevice. The next morning, either the paired female's original mate, or another male matched to his size, was introduced into her aquarium and all agonistic behaviors recorded (Caldwell, 1985). Contests were terminated when one animal avoided the crevice. The next day, the other male was introduced into the paired female's container and their interaction scored. The paired male was tested against the unfamiliar brooding female on the same day that the paired female was being tested against the unknown male. This comparison was completed for 12 of the 15 pairs. In the other three, the paired males died prior to testing, but their females were compared against unpaired males.

Results

One or more aggressive acts occurred in only one of the 12 interactions between members of former pairs while aggression took place in 17 of 27 interactions between non-pairs ($G = 10.9$, $P < 0.001$). Contests between non-paired animals escalated rapidly. In 14 of the 17 contests between non-pair members involving aggression, the first act (either

by male or female) after the male approached was a threat, lunge or strike. Eight of these contests ultimately escalated with one or both participants delivering potentially damaging strikes. The one aggressive interaction between members of a former pair involved a single lunge-threat by the female and did not escalate to physical contact ($G = 7.0$, $P < 0.01$). Only one of the previously paired females responded aggressively toward her former mate. When meeting unknown males, this female, plus 2 others, were aggressive (McNemar Test, $P > 0.1$). None of the paired males acted aggressively toward their former mates, but 6 were aggressive to unknown females (McNemar Test, $P < 0.05$).

Discussion

Reduced aggression between former pair-members demonstrates that individuals recognise and remember one another for at least two weeks without intervening contact. Competition for cavities and the possibility that males encounter their former mates while searching for a home have probably shaped this ability. Should a male injure and/or evict his former mate while she is still brooding, the offspring probably would be lost, reducing his fitness as well as hers. Since females occasionally move their eggs to another crevice, males must recognise a specific individual and not just the brood chamber.

Brooding females appear hesitant to initiate attacks against any intruding male, making it difficult to determine if females recognise their former mates. On the other hand, males did not attack former mates, but attempted to evict other brooding females, demonstrating that it is not simply the presence of eggs that causes a reduction in aggression. When eggs were removed from females and their former mates introduced, there was no aggression. This makes it unlikely that males fail to attack because they recognize the eggs as their own (Caldwell, in prep.). Whether recognition is chemically or visually mediated is unknown, but intense initial bouts of antennulation by males suggest that they are using chemical cues.

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